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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* STEVEN SAY-KYOUN OW  
And TAE JIN EOM

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Appeal 2008-1297  
Application 09/121,152  
Technology Center 1700

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Decided: May 13, 2008

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Before EDWARD C. KIMLIN, BRADLEY R. GARRIS, and  
KAREN M. HASTINGS, *Administrative Patent Judges*.

GARRIS, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 21-28, 30-38, 40, 42-46, and 48-50. We have jurisdiction under 35 U.S.C. § 6.

We AFFIRM.

Appellants claim a method of de-inking waste printed paper comprising contacting (i.e. pulping) the waste printed paper with an enzyme which dislodges ink particles therefrom in an aqueous medium at a pH between 3 and 8.

Further details regarding this subject matter are set forth in representative independent claim 21 and dependent claim 26 which read as follows:

21. A method of de-inking waste printed paper, comprising

a) pulping at a pH between 3 and 8 waste printed paper with an enzyme capable of dislodging ink particles from the waste printed paper in an aqueous medium at a pH between 3 and 8, wherein ink is dislodged from the waste printed paper by action of the enzyme; and

b) removing the dislodged ink particles from the resulting pulp containing medium.

26. The method of Claim 21 wherein said enzyme is selected from the group consisting of cellulases derived from *Trichoderma viride*, *Aspergillus niger*, hemicellulases, other carbohydrases and mixtures thereof.

The references set forth below are relied upon by the Examiner as evidence of obviousness:

Koa Soap Co. Ltd.	JP A-5909299 (as translated)	Jan. 18, 1984
Hageman	4,548,674	Oct. 22, 1985
Fuentes	4,923,565	May 8, 1990

The following prior art rejections are listed in the Answer (Ans. 5-7) as being advanced in this appeal.<sup>1</sup>

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<sup>1</sup> The final rejection based on 35 U.S.C. § 112, first paragraph, has been withdrawn by the Examiner (Supplemental Examiner's Answer mailed June 27, 2007 (Ans.) 4). Also, the prior art rejections listed in the Answer are somewhat modified versions of the prior art rejections listed in the Final Office Action. According to the Examiner, this modification of the prior art rejections "merely places the rejections in proper form for appeal" (Ans. 4). Because Appellants do not object to this modification (Reply Br. 2), we consider it to be harmless, and we will treat the prior art rejections listed in the

Claims 21-25, 27, 30, 31, 33, 34, 36, 37, 40, 42-26, 49, and 50 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '299; claims 26, 32, 35, and 48 are correspondingly rejected over this reference and further in view of Fuentes; and claims 28 and 38 are rejected under § 103(a) as being unpatentable over JP '299 in view of Hageman.

Appellants' arguments regarding independent claim 21 are reiterated with respect to independent claim 31 (Reply. Br. 18). No additional arguments have been advanced against claim 31 (*id.*). Accordingly, in considering the arguments regarding these claims, we will focus on representative claim 21. The rejection of dependent claims 26, 32, 35, and 48 over JP '299 and Fuentes has been separately argued, although none of the individual claims in this rejection has been separately argued (Reply Br. 18-20). We select claim 26 as representative of the claims argued in this rejection. Appellants have made no other separate arguments against the remaining appealed claims, which are all dependent claims, including separately rejected claims 28 and 38 (Reply Br. 21).

For the above stated reasons, this decision will specifically address only independent claim 21 and dependent claim 26.

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Answer as the rejections submitted for review on this appeal by both the Examiner and the Appellants. Moreover, because the Reply Brief specifically addresses the modified prior art rejections as listed in the Answer, our assessment of Appellants' arguments concerning these rejections will focus primarily on the Reply Brief although the Appeal Brief (i.e., the Substitute Appeal Brief filed Jan. 11, 2007) also has been fully considered in our assessment.

Based on the opposing positions of the Examiner and Appellants, the issues presented by this appeal are (1) whether the evidence provided by the Examiner and the Appellants on balance establish a prima facie case of obviousness and, if so, (2) whether the evidence of record ultimately weighs most heavily in favor of a conclusion of obviousness versus nonobviousness.

For the reasons which follow, the record of this appeal leads us to conclude that the subject matter defined by representative claims 21 and 26 would have been obvious within the meaning of 35 U.S.C. § 103(a).

*The issue of prima facie obviousness*

The Examiner correctly finds (Ans. 5) that JP '299 teaches a method of pulping and de-inking waste paper with a de-inking agent containing cellulase enzymes which can be used "without any special restriction, but alkaline cellulase is especially preferred" wherein "[a]lkaline cellulase is one having optimum pH 8.0 - 11.5 (preferably 8.1 - 11.0)" (JP '299: Translation 2-3). Also correct is the Examiner's finding (Ans. 5) that JP '299 teaches "[s]uch enzyme [i.e., presumably alkaline cellulase] retains its activity in the alkaline range as well as the acid and neutral range" (JP '299: Translation 3).

The Examiner acknowledges that JP '299 fails to teach practicing the pulping and de-inking method at a pH between 3 and 8 as required by independent claim 21 but, based on the above-noted findings, concludes that it would have been obvious for one with ordinary skill in this art to practice the method in this pH range based on a reasonable expectation of successfully retaining enzyme activity and achieving the desired de-inking (Ans. 5-6).

Appellants argue there is no prima facie case for the Examiner's conclusion that it would have been obvious to operate the JP '299 method at a pH between 3 and 8 (Reply Br. 7-13; *see also* App. Br. 14-18). In support of this argument, Appellants rely upon Declarations under 37 C.F.R. § 1.132 by Ericksson signed March 19, 2004 (Ericksson), Eveleigh signed April 12, 2004 (Eveleigh I), Eveleigh signed March 8, 1996 (Eveleigh II), and Schmidt signed May 7, 2004 (Schmidt). As further support for this argument, Appellants also rely on an article entitled "Neutral Deinking Makes its Debut," *Pulp and Paper International*, Oct. 1993 (PPI article).

According to the Ericksson and Eveleigh I Declarations, "[a] possible reading of the [JP] '299 patent [sic] is that it is possible for cellulase enzymes to have activity at all pH ranges, but one skilled in the art at the time of this invention would not have tried to deink at a neutral pH, or non-alkaline conditions, because it was thought that alkaline conditions were required to achieve the swelling of the fibers necessary to remove the ink particles" (para. 5 of both Ericksson and Eveleigh I). These Declarations further state that, "[a]bsent alkaline conditions, one would not have expected swelling, and therefore deinking, to occur as a result of the addition of deinking enzymes alone in the pulping process" (para. 6 of both Ericksson and Eveleigh I). Similarly, Eveleigh II declares that "no one skilled in the art of cellulases would waste time, money or effort in evaluating cellulase alone and without its combination with other de-inking agents" (para. 5). Finally, each of the Declarations by Ericksson, Eveleigh I, and Schmidt refer to the PPI article as supporting the proposition that de-inking in neutral conditions was not practiced in the prior art.

For a number of reasons, this evidence does not forestall the establishment of a *prima facie* case of obviousness.

First, each of the Ericksson, Eveleigh I, and Eveleigh II Declarations is narrowly focused on the proposition that one would not have expected de-inking to occur as a result of "deinking enzymes alone" (Ericksson and Eveleigh I, para.) or "cellulase alone without its combination with other de-inking agents" (Eveleigh II, para 5). However, the methods claimed by Appellants and disclosed by JP '299 are not limited to such a narrowly focused proposition. Specifically, the method defined by the representative claims is open to the inclusion of de-inking agents other than the recited enzyme by virtue of the claim 21 term "comprising." *See In re Crish*, 393 F.3d 1253, 1257 (Fed. Cir. 2004) ("comprising" allows other elements within the scope of the claim). Similarly, JP '299 expressly teaches that better de-inking occurs when the de-inking cellulase enzyme is used in combination with other de-inking agents such as surfactants and builders (Translation 3, penultimate and last paras).

Second, Ericksson and Eveleigh I also are narrowly focused in stating that de-inking with enzymes would not be expected to occur "[a]bsent alkaline conditions" (para. 6 of both Declarations). This focus is overly narrow because the representative claims on appeal include enzyme de-inking methods under conditions between pH 7 and 8 (e.g., 7.9) which are mild but nevertheless alkaline.<sup>2</sup> In this latter regard, we emphasize that Ericksson and Eveleigh I do not restrict the reference to "alkaline conditions" (*id.*) to a scope

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<sup>2</sup> See the definition of "pH" in *Hawley's Condensed Chemical Dictionary*, 14<sup>th</sup> Ed., which characterizes a pH value of 8 as on the alkaline side of neutrality.

which would exclude the relatively mild alkaline conditions at, for example, pH 7.9.

Third, the Schmidt Declaration and PPI article merely relate to a commercial de-inking operation which is practiced under neutral conditions. Accordingly, this Declaration and article do not directly evince that an artisan would not have practiced the JP '299 method at a pH condition (e.g., pH 7.9) within the range required by the representative claims.

Our foregoing consideration of the evidence for and against obviousness provided by the Examiner and Appellants leads us to agree with the Examiner's conclusion that it would have been *prima facie* obvious for an artisan to practice the de-inking method of JP '299 at a pH between 3 and 8 as required by representative claims 21 and 26. This conclusion is supported by the JP '299 teaching that the de-inking enzyme thereof "retains its activity in the alkaline range as well as the acid and neutral range" (Translation 3). This teaching would have given the artisan a reasonable expectation that the enzyme would be an active de-inking agent in the alkaline, neutral and acid ranges encompassed by Appellants' claimed pH range. *See Pfizer, Inc. v. Apotex*, 480 F.3d 1348, 1364 (Fed. Cir. 2007) (the expectation of success need only be reasonable, not absolute).

An obviousness conclusion also is supported by the well established legal principal that it would have been obvious to determine workable values for an art recognized, result effective variable. *Id.*, 480 F.3d at 1368; *see also In re Boesch*, 617 F.2d 272, 276 (CCPA 1980). On this record, it is undisputed that pH is an art recognized, result effective variable in de-inking methods of the prior art as evidenced by JP '299. For this reason, an artisan



would have sought to determine suitable pH values throughout the enzyme activity ranges taught by JP '299 including not only the alkaline range but also the neutral and acid ranges. *See In re Geisler*, 166 F.3d 1465, 1471 (Fed. Cir. 1977).

Concerning the rejection of claim 26 over JP '299 in view of Fuentes, Appellants additionally argue that the combined disclosures of these references do not establish a prima facie case of obviousness because the method of Fuentes relates to using cellulase enzymes of the type here claimed for paper pulp defibering rather than de-inking (Reply Br. 19). Though Fuentes may not be directed to de-inking, nevertheless this reference evinces that the claim 26 enzymes were known to those having ordinary skill in this art, and Appellants do not argue otherwise with any reasonable specificity. Like the Examiner, we conclude that it would have been prima facie obvious for an artisan to use these known cellulase enzymes in the de-inking method of JP '299 based upon the reasonable expectation of success derived from the JP '299 teaching that "[c]ellulase ... can be used in this invention without any special restriction, but alkaline cellulase is especially preferred" (Translation 2).

Having determined that a prima facie case of obviousness exists with respect to each of representative claims 21 and 26, we now proceed to an evaluation of Appellants' proffered evidence of nonobviousness.

*The ultimate issue of obviousness versus nonobviousness*

As evidence of nonobviousness in the form of unexpected results, Appellants refer to the Declarations under 37 C.F.R. § 1.132 by Kaplan

bearing a date of November 22, 2004 (Kaplan I) and by Kaplan signed February 22, 2006 (Kaplan II). According to Appellants, "Kaplan I and II describe the results obtained from a series of comparative tests that establish de-inking waste printed paper according to the present invention where an enzyme is used at a pH between 3 and 8 unexpectedly improves the brightness of the treated pulp (Paper L-value) and the whiteness of the filtrate (Filtrate L-value) compared with a de-inking method that uses an enzyme and 1% NaOH" (Reply Br. 13).

This last mentioned prior art comparative method is intended to represent Example II of JP '299 (*see* para. 4 of each Declaration). Because it was not possible to obtain any of the enzymes described on Translation page 3 of JP '299, the comparative method used "an equivalent alkaline cellulase from Meiji Seika, HEP-100, an alkaline cellulase which is active over a range of at least 4.0 to 10.0, with a pH optimum of 8.0" (para. 5 of both Declarations). For the inventive method, "a neutral cellulase was obtained from Novozymes, Novozym 342 produced by the fungus *Humicola insolens*, which has an optimum pH of between 6.5 and 7.5" (*id.*). The comparative method was conducted at a pH of at least 10.6 whereas the inventive method was conducted at a pH of between 7.2 and 7.6 (para. 4 of both Declarations). These tests yielded Paper L-value and Filtrate L-value results which were characterized as "more effective" or "superior" with respect to the inventive method (*see* paras. 7 and 8 of both Declarations).

The Kaplan I and II Declarations do not establish unexpected results for the following reasons.

First, the results are characterized by the Declarant only as "more effective" or "superior" (*id.*), not unexpected.<sup>3</sup> This is particularly significant because the test results standing alone do not demonstrably evince an unexpected outcome (e.g. substantially improved results). See *In re Geisler*, 116 F.3d at 1470. For example, Kaplan I reports Paper L-values of 65.9% for the prior art comparative test and 66.6% for the inventive test. While the 0.7 percentage point improvement of the invention is unquestionably superior to the prior art comparison, this seemingly modest improvement does not evince, on its face, an outcome which would have been unexpected by one with ordinary skill in this art. For all we know, this Paper L-value difference would have been expected by an artisan as a typical consequence of conducting the prior art and invention tests with different enzymes (i.e., HEP-100 and Novozym 342 respectively; see paragraph 5 of Kaplan I and II) which was mentioned above and will be discussed more fully below.

Second, the improved results shown in Kaplan I and II are inconclusive as to whether the improvements were due to the use of different pH conditions (representing the invention and prior art respectively) as urged by Appellants or instead were due to the use of different enzymes. As mentioned previously, the prior art comparative tests in Kaplan I and II employed "HEP-100, an alkaline cellulase which is active over a range of at least 4.0 to 10.0, with a pH optimum of 8.0" (*see* para. 5 of both Declarations). On this record, it appears that this alkaline cellulase is encompassed by the representative claims since it satisfies the claim 21 requirement for "an enzyme capable of dislodging

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<sup>3</sup> While Appellants' attorney refers to these results as unexpected (Reply Br. 13; *see also* App. Br. 21), attorney argument is no substitute for evidence. *Enzo Biochem, Inc. v. Gen-Probe, Inc.*, 424 F.3d 1276, 1284 (Fed. Cir. 2005).

particles from the waste printed paper in an aqueous medium at a pH between 3 and 8." Despite this fact, the HEP-100 enzyme used in the prior art comparative test was not also used in the inventive test. Instead, an entirely different enzyme (i.e., Novozym 342) was used in the inventive test (*id.*). Therefore, it is unclear whether the different results of these tests were due to the use of different enzymes or different pH conditions.

Third, the Kaplan I and II results are not commensurate in scope with representative claims 21 and 26. *See In re Peterson*, 315 F.3d 1325, 1330-31 (Fed. Cir. 2003). These claims define a method which is practiced at a pH between 3 and 8. In contrast, the inventive tests of the Kaplan I and II Declarations were practiced only at pH values greater than 7 and less than 8 (*see* para. 4 of both Declarations). None of the inventive tests were practiced at the neutral to acid pH ranges encompassed by the representative claims. The appeal record provides no way of knowing whether improved results would occur when practicing the inventive method under these last mentioned pH conditions. Similarly, the inventive tests of the Kaplan Declarations were practiced using only a single enzyme, namely, Novozym-342 (para. 5 of both Declarations). On the other hand, claim 21 encompasses any "enzyme capable of dislodging particles ... at a pH between 3 and 8," and claim 26 encompasses any enzyme "consisting of cellulases derived from *Trichoderma viride*, *Aspergillus niger*, hemicellulases, other carbohydrases and mixtures thereof." Again, the appeal record provides no way of knowing whether the improved results shown with respect to Novozym 342 also would be exhibited by the other enzymes encompassed by the representative claims.

Finally, we emphasize that, although secondary considerations of nonobviousness must be taken into account, they do not necessarily control the obviousness conclusion. *Pfizer, Inc. v. Apotex*, 480 F.3d at 1372. Here, the record establishes a strong case of obviousness whereas the Kaplan I and II Declarations in support of nonobviousness (1) fail to characterize the results as being unexpected, (2) are inconclusive as to whether the argued pH parameter was responsible for generating these results, and (3) are not commensurate in scope with the representative claims on appeal.

These circumstances warrant an ultimate determination that the method defined by claims 21 and 26 would have been obvious to one with ordinary skill in this art in view of the prior art applied by the Examiner.

### *Conclusion*

For the above stated reasons, we sustain: (1) the § 103 rejection based on JP '299 of representative claim 21 and of (not separately argued) claims 22-25, 27, 30, 31, 33, 34, 36, 37, 40, 42-46, 49, and 50; (2) the § 103 rejection based on JP '299 in view of Fuentes of representative claim 26 and of (not separately argued) claims 32, 35, and 48; and the (not separately contested) § 103 rejection based on JP '299 in view of Hageman of claims 28 and 38.

The decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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